

D0Note 4430

Cabling for the Run IIb L1 Calorimeter Upgrade

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Abstract

The new ADF electronic on the level 1 trigger requires redoing the mapping of the existing cables coming from the BLS Cards. To avoid unnecessary movement of cables we decide to put transition panels between ADF racks keeping them as close as possible of the old location. Also cable trays from each ADF rack to the TAB rack as each TAB will receive cable inputs from each ADF crate.

Introduction

The new ADF crates require to redoing the mapping of the existing cables coming from the BLS Cards. The new ADF crates contain 20 ADF cards each with 16 TT(x2 Hadronic and EM TT) as it's shown in the [Figure 1](#) therefore each rack is going to have 320 TTs instead of 128 TTs.

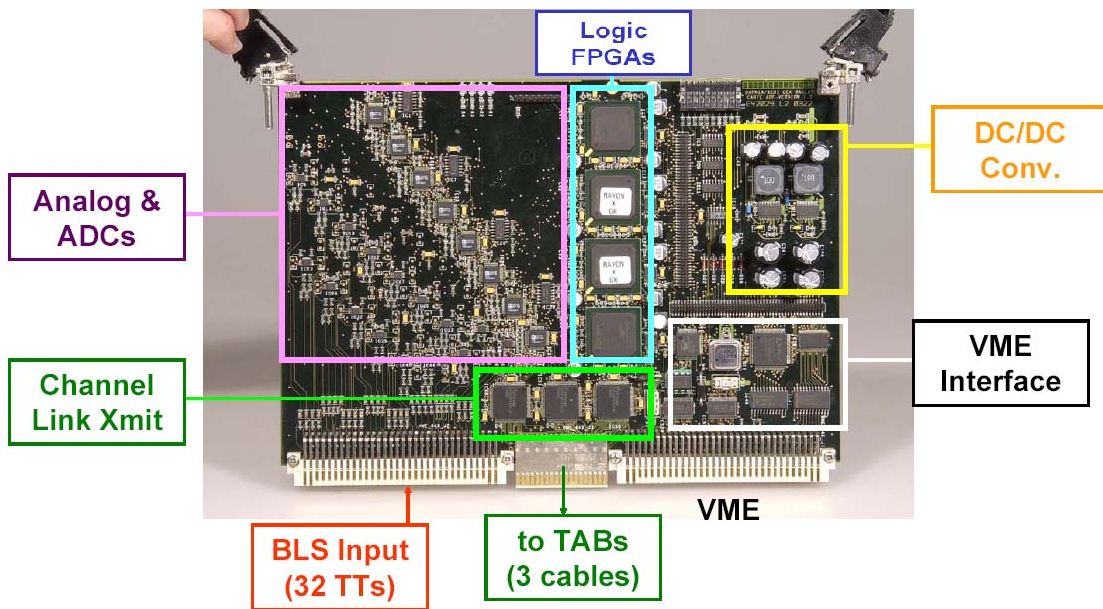


Figure 1: ADF prototype 16x2 TTs
Each ADF sends out 3 cables carrying identical copies of its data. Each TAB accepts 30 ADF cables [Figure 2](#).

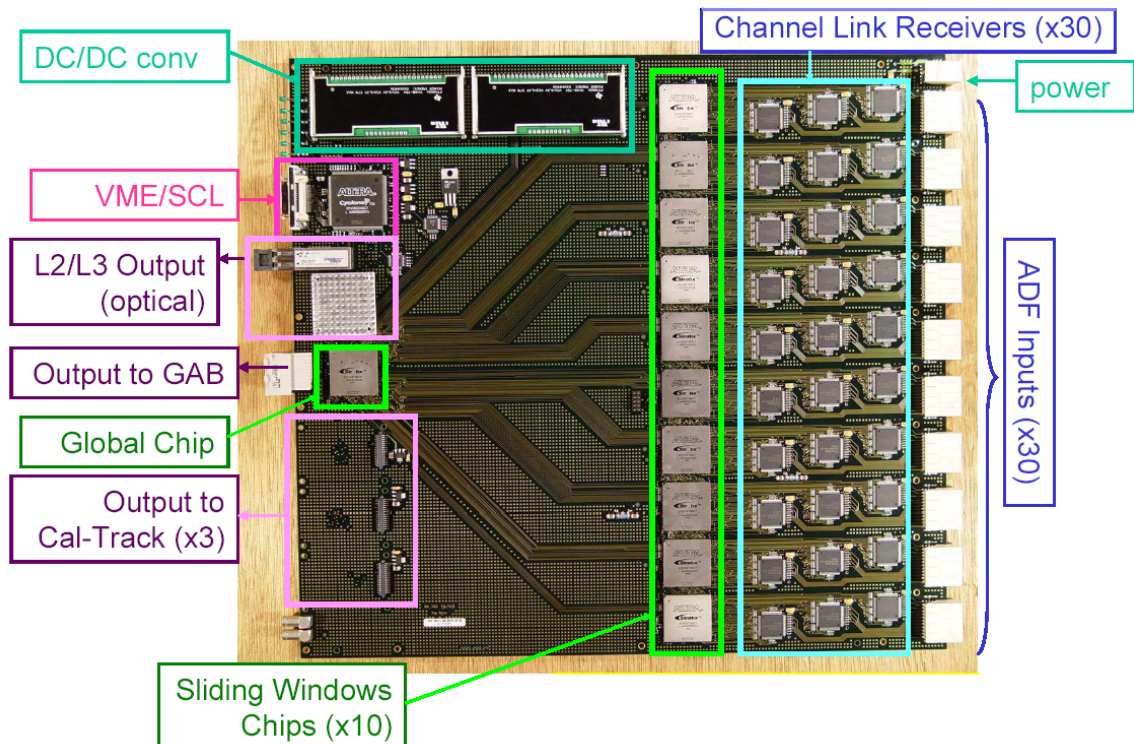


Figure 2: TAB prototype. 30 ADF inputs.

Current Physical Layout

Ten racks are used to hold the Level 1 Calorimeter Trigger, which is located in the first floor moving counting house. Each rack contains the CTFE cards for 128 trigger towers TT (all 32 ϕ 's for four consecutive η 's) as it is shown in [Figure 3](#). [\[1\]](#) [\[2\]](#) [\[3\]](#)

M103 TT $\eta=(+1:+4)$	M107 TT $\eta=(+9:+12)$	M111 TT $\eta=(+17:+20)$
M104 TT $\eta=(-1:-4)$	M108 TT $\eta=(-9:-12)$	M112 TT $\eta=(-17:-20)$
M105 TT $\eta=(+5:+8)$	M109 TT $\eta=(+13:+16)$	
M106 TT $\eta=(-5:-8)$	M110 TT $\eta=(-13:-16)$	

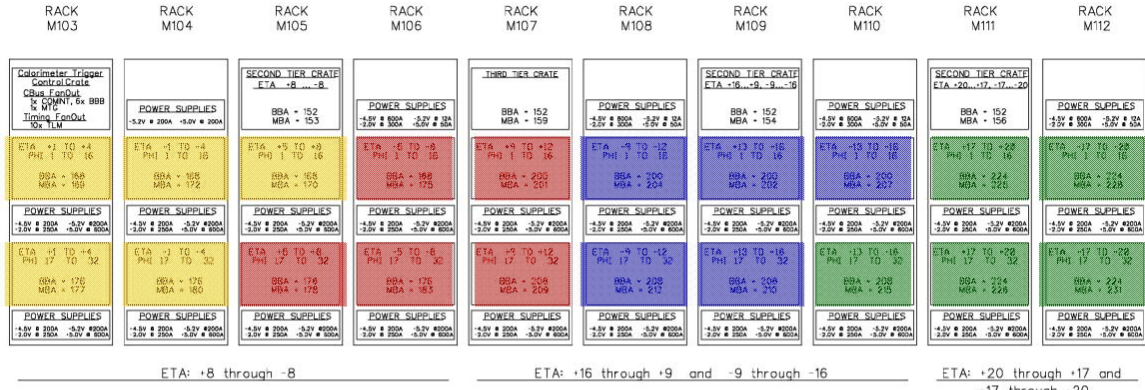


Figure 3: Diagram of Existing L1 CAL Run I Trigger Rack Layout

Upgrade Physical Layout

The new ADF's racks are going to be located on M104, M106, M109 and M111 as it is shown in [Figure 4](#). The TAB rack is going to be located on M108 and the other racks are going to be used to set up the patch panels to keep the old cables as close as possible to the old location.

Run I L1 CAL Trigger Current Rack Layout



Draft of Run IIB L1 CAL Upgrade Trigger Rack Layout

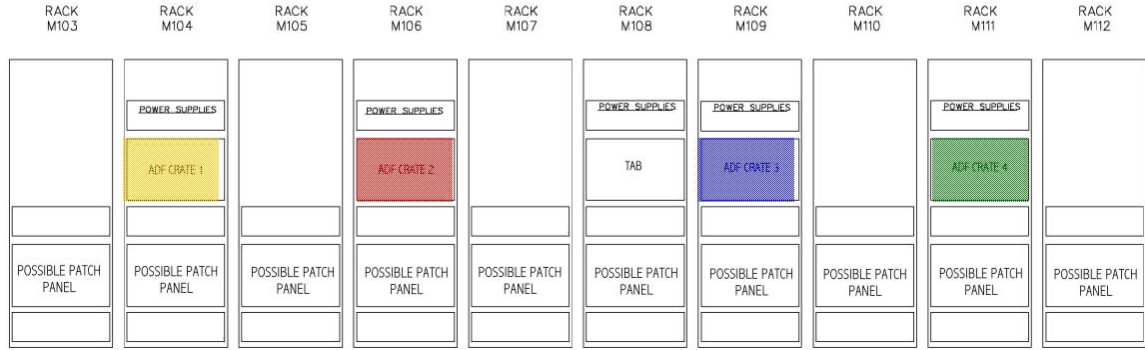


Figure 4: Localization of the new ADF and TAB rack comparing with the old rack location. The color code is used to show how the cables are going to be reassigned.

Each ADF rack contains only one ADF crate, which contains 20 ADF boards with 16 channels each. Also each channel has linked with one trigger tower. In that way each ADF rack has 320 TT. [\[4\]](#)

ADF Rack 1 ("M104")

$$TT \quad \eta = (+1 : +4) \times \phi = (1 : 32) + \eta = (-1 : -4) \times \phi = (1 : 32) + \eta = (+5 : +8) \times \phi = (1 : 16)$$

ADF Rack 2 ("M106")

$$TT \quad \eta = (+5 : +8) \times \phi = (17 : 32) + \eta = (-5 : -8) \times \phi = (1 : 32) + \eta = (+9 : +12) \times \phi = (1 : 32)$$

ADF Rack 3 ("M109")

$$TT \quad \eta = (-9 : -12) \times \phi = (1 : 32) + \eta = (+13 : +16) \times \phi = (1 : 32) + \eta = (-13 : -16) \times \phi = (1 : 16)$$

ADF Rack 4 ("M111")

$$TT \quad \eta = (-13 : -16) \times \phi = (17 : 32) + \eta = (+17 : +20) \times \phi = (1 : 32) + \eta = (-17 : -20) \times \phi = (1 : 32)$$

We labeled the ADF boards from 1 to 80. Where boards 1 to 20 are in rack number 1 and so on. The eta & phi distribution per board is shown in [Figure 5](#).

ADF Board – Trigger Eta & Phi Distribution									
Trigger Eta vs Phi	Current Rack	1 4	5 8	9 12	13 16	17 20	21 24	25 28	29 32
-17 –20	M112	73	74	75	76	77	78	79	80
-13 –16	M110	57	58	59	60	61	62	63	64
-9 –12	M108	41	42	43	44	45	46	47	48
-5 –8	M106	25	26	27	28	29	30	31	32
-1 –4	M104	9	10	11	12	13	14	15	16
1 4	M103	1	2	3	4	5	6	7	8
5 8	M105	17	18	19	20	21	22	23	24
9 12	M107	33	34	35	36	37	38	39	40
13 16	M109	49	50	51	52	53	54	55	56
17 20	M111	65	66	67	68	69	70	71	72

Figure 5: Eta-Phi distribution per ADF board comparing with the current Eta-Phi distribution per rack. Yellow=ADF Rack 1, Red= ADF Rack 2, Blue=ADF Rack 3 and Green=ADF Rack 4.

Cables

There are 1280 trigger towers and each trigger tower comprises an EM and an HAD channel. There are 2560 analog channels in total. As each ADF card accommodates 32 channels (2×16), there are 80 ADF cards in total. These are housed in 4 fully populated 21-slot crates. Each crate contains 20 ADF cards and a VME Interconnect to make the interface to the Trigger Control Computer (TCC) [Figure 6](#).

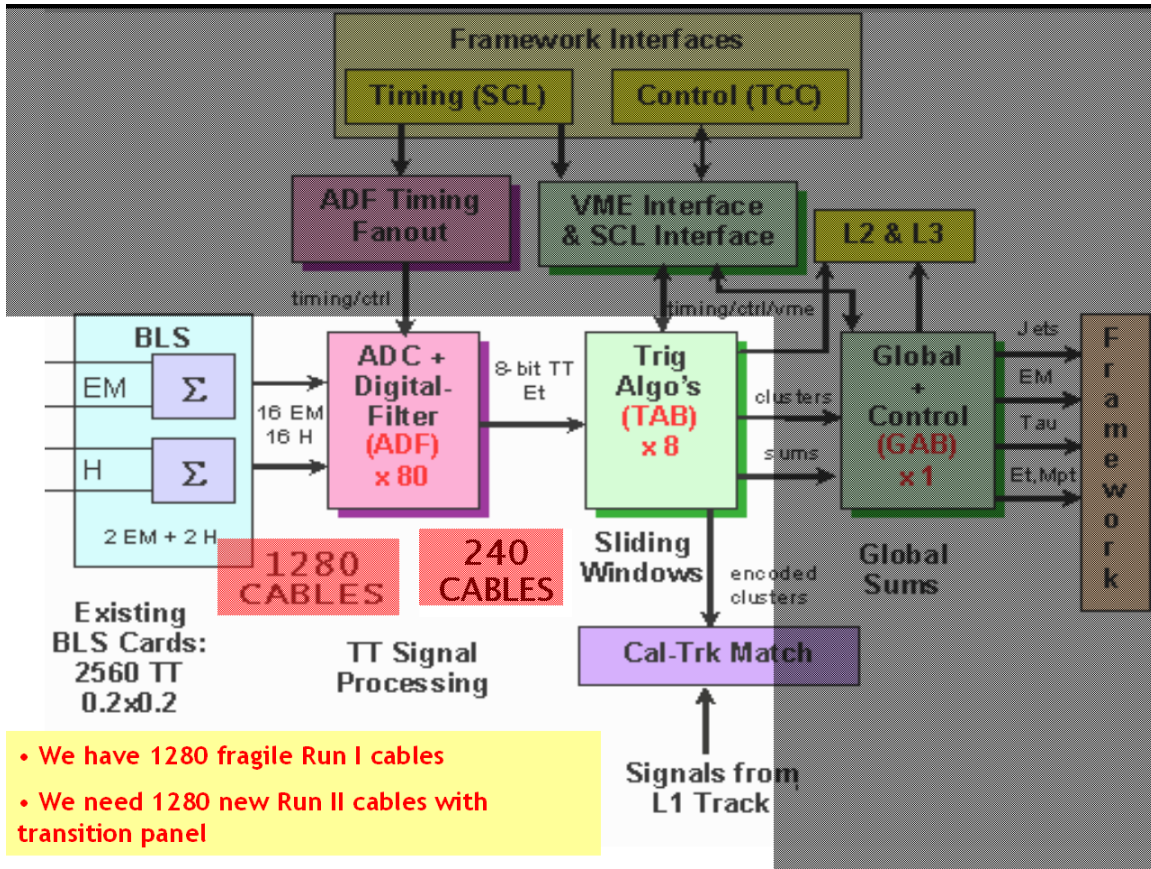


Figure 6. Block diagram of L1 calorimeter trigger, with the baseline subtractor (BLS) cards

Each ADF sends out 3 cables carrying identical copies of its data. Each TAB accepts 30 ADF cables giving it more than the 40×9 TTs of data in $\eta \times \phi$ that it requires to find Rols over the full eta range and 4 phi slices. The cabling diagram between the 80 ADFs and 8 TABs is shown in [Figure 7](#) and [Figure 8](#).

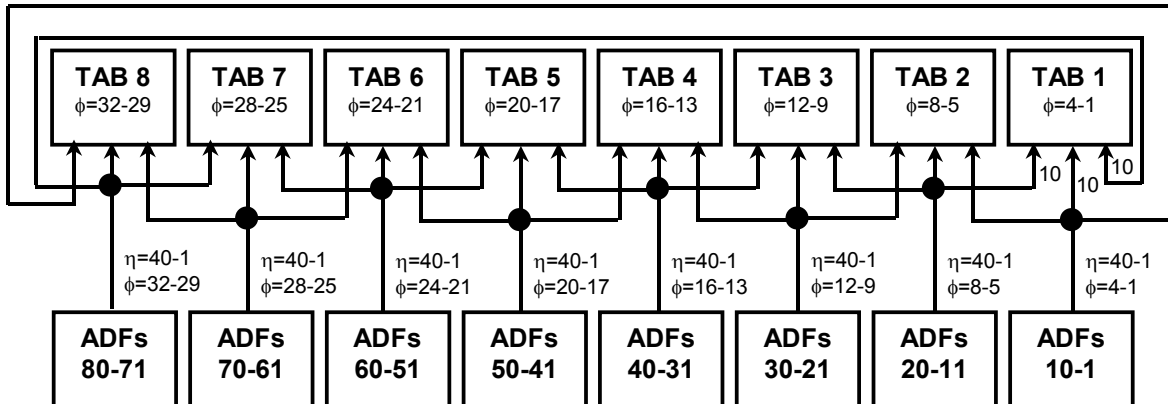


Figure 7: Diagram of cabling between the ADFs and the TABs

TAB Board #	1			2			3			4		
	29-32	1-4	5-8	1-4	5-8	9-12	5-8	9-12	13-16	9-12	13-16	17-20
	A	B	C	A	B	C	A	B	C	A	B	C
1 _____-20 -17	80	73	74	73	74	75	74	75	76	75	76	77
2 _____-16 -13	64	57	58	57	58	59	58	59	60	59	60	61
3 _____-12 -9	48	41	42	41	42	43	42	43	44	43	44	45
4 _____-8 -5	32	25	26	25	26	27	26	27	28	27	28	29
5 _____-4 -1	16	9	10	9	10	11	10	11	12	11	12	13
6 _____1 4	8	1	2	1	2	3	2	3	4	3	4	5
7 _____5 8	24	17	18	17	18	19	18	19	20	19	20	21
8 _____9 12	40	33	34	33	34	35	34	35	36	35	36	37
9 _____13 16	56	49	50	49	50	51	50	51	52	51	52	53
10 _____17 20	72	65	66	65	66	67	66	67	68	67	68	69

TAB Board #	5			6			7			8		
	13 16	17 20	21 24	17 20	21 24	25 28	21 24	25 28	29 32	25 28	29 32	1 4
	A	B	C	A	B	C	A	B	C	A	B	C
1 _____-20 -17	76	77	78	77	78	79	78	79	80	79	80	73
2 _____-16 -13	60	61	62	61	62	63	62	63	64	63	64	57
3 _____-12 -9	44	45	46	45	46	47	46	47	48	47	48	41
4 _____-8 -5	28	29	30	29	30	31	30	31	32	31	32	25
5 _____-4 -1	12	13	14	13	14	15	14	15	16	15	16	9
6 _____1 4	4	5	6	5	6	7	6	7	8	7	8	1
7 _____5 8	20	21	22	21	22	23	22	23	24	23	24	17
8 _____9 12	36	37	38	37	38	39	38	39	40	39	40	33
9 _____13 16	52	53	54	53	54	55	54	55	56	55	56	49
10 _____17 20	68	69	70	69	70	71	70	71	72	71	72	65

Figure 8: ADF Output Distribution to TAB per ADF board, per SW chip. Yellow=ADF Rack 1, Red= ADF Rack 2, Blue=ADF Rack 3 and Green=ADF Rack 4.

Acknowledgements

The necessary documentation and pictures were provided for Hal Evans (Columbia University).

<http://www.nevis.columbia.edu/~evans/l1cal/hardware/hardware.html>

References

[1] For a description of the calorimeter layout, layers, and towers, see D0 Note 774, "Calorimeter Addressing - Version 1.1", Jim Linnemann (11/7/88).

The full description of the current BLS cable runs is provided in:

[2] "Central BLS Card to Calorimeter Trigger Front-End Card" Hans Evans (6/6/90)

(http://www.pa.msu.edu/hep/d0/ftp/run1/l1/caltrig/cabling/central_bls_card_to_ctfe_card.txt)

[3] "End Cap BLS Card To Calorimeter Trigger Front-End Card" Hans Evans (6/6/90)

(http://www.pa.msu.edu/hep/d0/ftp/run1/l1/caltrig/cabling/end_cap_bls_card_to_ctfe_card.txt)

[4] A full map can be found on the following spread sheet:

(http://www2.uic.edu/~mcamuy2/trigger/Cables_BLS_CTFE_New_Conf_A05.xls)